

WASHINGTON

SCIENCE TRENDS

HIGHLIGHTS

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* V/STOL AIRCRAFT

Federal Aviation Agency, in a new report, concludes that present technology is capable of producing practical aircraft with vertical and short takeoff and landing (V/STOL) characteristics. This design, because of its flexibility, is said to be more promising for civil aviation than an aircraft designed for STOL performance only. FAA's evaluation indicates:

- ✓ Helicopter with its low downwash velocities, greater efficiency in hover, flexible slow-speed maneuvering characteristics, external load-carrying or crane capability but relatively low speed potential best fits the following markets (a) Utility-Industrial; (b) Private; (c) Business; (d) Air Taxi; and (e) Urban Area Airline. (Approximate stage length 15 miles.) Helicopter should remain the dominant type serving these markets for the next decade with continuous design improvements.
- ✓ Compound Aircraft with its higher speed, but less efficient helicopter characteristics, could operate within the short-haul and feeder line airline market (stage lengths of 50-100 miles) and to a lesser extent the business aircraft market. However, the more advanced development in this field faces a serious noise problem which may delay or restrict its use in commercial operations. Gear-driven types which reduce the noise problem are yet in their early development stages. Therefore, the time of entry of compound aircraft into civil operations is in doubt and may well depend upon military development programs.
- ✓ Tilt-Rotor Aircraft, with its still higher speed potential and helicopter type VTOL characteristics, fits the same general market and could also compete in the medium-haul (approximate stage lengths of 100-200 miles) market. This configuration is in its early design stages and possibility of entry into civil operations will depend on technological developments. Entry into commercial operation is unlikely prior to 1968-70.
- ✓ Tilt-wing plus Deflected Slipstream (propeller, rotor or radial lift combinations), with its even higher speed potential and correspondingly less slow speed efficiency, has promise in transport application. These configurations are in the same early development stages as the tilt-rotor type and entry into civil operations will depend on development programs.
- ✓ Turbojet V/STOL concepts depend upon engine development programs in which activity is underway. Success could lead to V/STOL designs subsequent to the 1970 time period.

(Technical Report includes compilation of characteristics and specifications of existing aircraft, test-beds and engines and concepts and proposals, world-wide. 161 Pages. \$1.75. Order "Project Hummingbird - FAA Technical Report" from Superintendent of Documents, Government Printing Office, Washington 25, D. C.)

* LOW TEMPERATURE PROCESS HEAT

The Atomic Energy Commission is interested in "expressions of interest" from organizations using process steam to participate in a demonstration low temperature process steam project incorporating a nuclear reactor. The reactor would serve industrial operations requiring large amounts of heat - such as chemical processing, the production of paper and pulp products or the conversion of saline water to fresh water. Any organization which uses or plans to use steam in 1964-1965 and thereafter will be eligible to participate. The AEC, under present plans, would construct and own the reactor.

(Details may be obtained by writing to: Manager, Chicago Operations Office, U. S. Atomic Energy Commission, Argonne, Ill. Due date for expressions of interest is June 19, 1961)

* HIGH TEMPERATURE ELASTOMERS

The Navy is interested in learning of firms having demonstrated research and development capabilities in the field of high temperature elastomers. The particular requirement is the ability to develop organic coatings of not more than 0.12" thickness with suitable dielectric properties for use on radomes. The coatings must be capable of resisting rain erosion for at least 30 minutes at speeds of 1,800 miles per hour. Inherent heat resistance of at least 400° F for extended periods is required.

* NEW PIGMENTS

The Navy is interested in learning of firms having demonstrated research and development capabilities in the theoretical relationship of atomic and molecular structures as related to optical properties. The particular requirement is the development of new white pigments suitable for formulation into organic coatings which have comparable reflectance to current titanium dioxide pigmented coatings in the ultraviolet and near infrared. Facilities required include equipment drying ovens, paint mill, spectrophotometer for reflectance measurements between the wavelengths of 0.3 to 2.2 microns.

(Interested firms must supply complete documentation including number of employees, number and professional qualifications of scientific and technical personnel who would participate, description of facilities, and outline of previous projects in this field with an evaluation of results. Submit to Chief, Bureau of Naval Weapons, Code RRMA-52, Washington 25, D. C. by June 1, 1961)

* NEW LUMINANCE STANDARDS

The National Bureau of Standards can now supply luminance standards for the precise evaluation of the luminance or "brightness" of aircraft instrument dials and panels, as well as other applications.

The standards consist of two components -- a diaphragmed flashed opal glass and an electric lamp, furnished with a report of calibration containing full instructions. Prices range from \$64 to \$72, depending upon the size of the lamp component.

Because of the accuracy with which brightness measurements may be made with the aid of these standards, they are also being used for other standardizing purposes -- for example, to achieve uniformity in the luminances of cathode ray tubes and television sets, and to calibrate meters employed by illumination engineers to measure the brightness of visual environments.

(Samples, and further details may be obtained from the Photometry and Colorimetry Section, National Bureau of Standards, Washington 25, D. C.)

TECHNICAL TRENDS

- Federal Communications Commission is seeking proposals for radio frequency amplifiers to be used during its forthcoming New York UHF-TV Tests. Details are available from Chief, Administrative Services Division, FCC, Washington 25, D. C. ✓✓✓ The Navy will study the effects of sea water scale formation on a single tube, 1200-gallon-per-day thin film sea water conversion unit developed by the General Electric Co. The unit is one part of a six-section evaporator proposed by GE for potential use on surface and sub-surface craft. ✓✓✓ Goodyear Aircraft is building an inflatable airmat gymnasium for use aboard the Polaris submarine USS Theodore Roosevelt. ✓✓✓ Under tentative plans, the National Aeronautics and Space Administration will charge royalties for industrial use of its patents, with the Department of Justice acting as policing agent -- a new approach to the patent problem. There has never been a prosecution for unauthorized use of a Government-owned patent.
- The new Federal Helium Research Center at Amarillo, Tex. will be supervised by L. Warren Brandt, who has been in charge of operations research in helium for the U. S. Bureau of Mines. ✓✓✓ Details of the Atomic Energy Commission's "withdrawal" from routine production and sale of Cobalt-60, and a list of commercial sources of supply is available in Announcement D-108 from Information Office, U. S. Atomic Energy Commission, Washington 25, D. C. ✓✓✓ Air Force plans to award contracts in the near future for a color television tape recording system so that briefings can be recorded on the West Coast and played back in Washington the next day. Eventually, a closed circuit television system linking major facilities on the East and West Coast directly, may be acquired. Officials at the Pentagon could presumably watch the progress of various launchings anywhere in the Nation.
- A brief review of planned spending for peaceful uses of atomic energy abroad is available from the Power and Equipment Division, Business and Defense Services Administration, U. S. Department of Commerce, Washington 25, D. C. Ask for Announcement BD 61-77. ✓✓✓ The Air Force has agreed to ship liquid hydrogen from the production facility at West Palm Beach, Fla. to various locations required by the civilian National Aeronautics and Space Administration. A tank truck - rail tank car - tank truck system will be used in the light of findings that this is more economical than transporting the product all the way across the country by truck. ✓✓✓ Congressional sources are seriously concerned over the near-collapse of the Government-Industry "cooperative" nuclear power program, typified by the termination of a gas-cooled heavy-water moderated power reactor planned for Florida due to "technical and economic uncertainties."
- Severe competition faced by the U. S. machine tool industry is outlined in a new report "World Trade in Metalworking Machine Tools" available for 70 cents from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. ✓✓✓ The Navy Bureau of Weapons has approved means for in-flight refueling of all carrier-based F4D Skyray aircraft. The method calls for installation of a refueling probe in one of the drop tanks for further transfer into the main fuel tanks. Direct fueling has not been practical because of structural limitations and the cost involved. ✓✓✓ The Federal Aviation Agency is extending its requirement that flight recorders be carried on all air carrier jets and other air carrier airplanes operating above 25,000 feet to include flight checks, training flights, ferry flights, airworthiness test flights and similar operations. ✓✓✓ FAA is prohibiting the use of portable FM radios in U. S. civil aircraft after tests showing that in some cases radios having oscillators operating within or very near the VHF band used in aircraft -- 108 to 118 megacycles -- caused interference with navigation instrumentation. Tests on other radios, dictating machines and recorders will continue. ✓✓✓ The Atomic Energy Commission has awarded 175 grants totaling \$1,950,797 to 165 educational institutions for purchase of laboratory equipment. Of these, 97 colleges and universities are receiving grants from the Commission for the first time as a result of decisions made last year to include colleges of arts and sciences as well as qualified engineering schools.

* ELECTROMAGNETIC COMPATIBILITY ANALYSIS

Air Force Systems Command, Electronic Systems Division, L. G. Hanscom Field, Mass. has awarded a \$2 million contract to the Armour Research Foundation, Chicago, Ill. in a program to develop methods for analyzing interference problems in military electronic devices and systems.

Initial emphasis will be on radar or pulse-type equipment, with the study extended to other types as methods of analysis are refined. Information on electronic devices to be furnished by the military services will include precise location of the instruments, hours of operation and spectrum signature. Emphasis will also be placed on radiation which is incidental to the main function of the equipment, which may be in the form of a wider bandwidth, side lobes or even leakage from signal-generating devices.

Analysis facility will be located at the Naval Engineering Experimental Station, Annapolis, Md. under Col. Charles C. Woolwine. Until remodeling is completed, about November, 1961, temporary facilities will be in Chicago.

The Analysis Center will examine:

- ✓ Characteristics, including spectrum signatures, of equipment under development to insure conformity with established standards.
- ✓ Spectrum signatures of equipments in particular operational environments to determine if interference problems exist.
- ✓ Operational environment conditions existing in problem areas.
- ✓ Possible development of simulators for use as frequency management or research and development tools.
- ✓ Operation as a central "library" which can promptly answer questions on equipment compatibility.

Note:

Probable interference problems in equipment under development will be handled by the Department of Defense under its Electromagnetic Compatibility Program. Should problems develop in existing equipment "corrective action" is prescribed under the DOD program -- including phase-out and replacement if necessary.

* SPACE LAUNCH OPERATIONS

The high cost of possible delays in launching spacecraft for lunar missions has led to increased efforts to provide reliable equipment and facilities at launch sites. The problem arises from the fact that only 6 to 8 days are available each month for each launching -- because of the relationship between the motion of the moon and the most practical method of launching vehicles from the earth to the moon.

Samuel Snyder, Assistant Director for Launch Operations, National Aeronautics and Space Administration, has advised Congress:

"Should the launch date be missed because of a lack of any particular facility or because of the inability to adjust for some of the problem areas, an automatic 1-month hold is necessary until the next lunar period arrives.

"For the current class of vehicles now being launched, this can amount to costs approximating \$500,000 per month as a consequence of increased overhead charges for contractor and range personnel. Delays in the more complicated or larger vehicles about to appear at the Ranges might very well result in accumulated costs in excess of \$1 billion per month.

"It may be seen readily that the price of suitable facilities is, in general, far less than the price of delay costs."

RESEARCH CHECKLIST

- ANALYZING ZINC-BASE ALLOYS: The U. S. Bureau of Mines has developed a relatively fast and inexpensive method for determining aluminum, iron, copper, cadmium and lead in zinc-base alloys. The method is especially helpful when a small amount of sample is available. Aluminum and iron are determined spectrophotometrically, and the other elements polarographically. Instruments required cost about \$4,000 or less, while a survey of manufacturers of zinc-base alloys revealed costs of \$12,000 to \$30,000 for performing similar studies with other instruments.
- (Details available in Report of Investigations No. 5727 available from Publications-Distributions Office, U. S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa., Single Copies Free)
- LIGHTWEIGHT IGNITION SYSTEM FOR HYDROGEN-OXYGEN ROCKETS: Two chemicals have been shown to provide excellent starting characteristics for hydrogen-oxygen rockets over a wide range of conditions. One is chlorine trifluoride which is hypergolic with hydrogen and the other, triethylaluminum, is hypergolic with oxygen. Both performed successfully over test conditions ranging from 140 to 550 psia chamber pressure and propellant mixtures from 9 to 70 percent fuel to cover the range of mixtures for both rockets and gas generators. A start with chlorine trifluoride required 0.038 lb. of the chemical and the ignition delay was less than 100 milliseconds. Approximately 0.031 lb. of triethylaluminum was required to achieve the same start delay. It is believed that practical lightweight start systems for this type of rocket can be developed to replace the conventional spark and solid propellant ignition units.
- (NASA Report TN D-684, "Ignition of Hydrogen-Oxygen Rocket Combustor with Chlorine Trifluoride and Triethylaluminum" available from National Aeronautics and Space Administration, ATTN: CODE BID, 1520 H Street, N. W., Washington 25, D. C.)
- X-RAY PROJECTION MICRORADIOGRAPHY: The application of an x-ray projection microscopic to metallurgical research has been studied by the Army's Tank-Automotive Command, with some encouraging results. Methods have been evolved for the preparation of the thin specimens necessary for such examination, and other techniques have been developed. Army researchers also believe that a slight modification of existing Norelco equipment would make it possible to record diffraction data or perform spectrochemical analyses over microscopic sample areas -- making the unit an even more useful metallurgical instrument.
- (Further details available in Report PB 171 381. 55 Pages. \$1.75 from OTS, U. S. Department of Commerce, Washington 25, D. C.)
- GAS LUBRICATED BEARINGS: The Air Force reports that a contractor has successfully operated a gas lubricated bearing throughout the temperature range 75° F to 1,500° F at speeds up to 65,000 rpm. Such bearings may be used in secondary power systems in advanced aerospace craft, where other advantages such as radiation resistance and very low friction, may be of value. Future research plans call for a new, all-ceramic rig in which such bearings will be subjected to temperatures up to 2,200° F. Gases to be investigated for their lubricating capabilities are nitrogen, helium, argon and carbon tetrafluoride. Overall objective of the program is to support a 100-pound load with minimum lubricant flow rates throughout the temperature and speed range.
- (R&D by Tribo-Netics Laboratories, Vermillion, Ohio reported by Materials Central, Aeronautical Systems Division, Air Force Systems Command, Dayton, Ohio)

P U B L I C A T I O N C H E C K L I S T

- PROJECT ROVER, a transcript of testimony, statements and exhibits on the U. S. Nuclear Rocket Development Program by officials from Government and Industry, with a great deal of detail on the potentials of this form of propulsion. 177 Pages. Single Copies Free. (Write Committee on Science and Astronautics, New House Office Building, Washington 25, D. C. for Hearings -- Project Rover)
- MEASUREMENT OF LOAD BY ELASTIC DEVICES, a new British report on the development of accurate elastic devices which can be used for the measurement of forces applied to experimental structures, the thrust of jet engines and rockets, and as weighing units for large structures in industry. 54 Cents. (Write British Information Services, 45 Rockefeller Plaza, New York 29, N. Y. for "Measurement of Load by Elastic Devices," NPL Notes on Applied Science No. 21)
- HIGH STRENGTH STAINLESS STEELS, a brief summary of recent developments in this field as reported during the period January 1 through March 31, 1961. 2 Pages. Single Copies Free to Government agencies, contractors, subcontractors and their suppliers. (Write Defense Metals Information Center, Battelle Memorial Institute, Columbus 1, Ohio for DMIC Memorandum No. 99)
- SOVIET SEISMOLOGY MANUAL, a U. S. translation of the first systematic, comprehensive geophysical study of a technique used in the Soviet Union for finding new petroleum, coal and ore deposits -- the so-called "correlation method of refractive waves." 343 Pages. \$3.50. (Write OTS, U. S. Department of Commerce, Washington 25, D. C. for Publication No. 60-11607)
- EUROPEAN OIL INDUSTRY, a study of the oil economy of Europe, with a prediction that oil consumption in the area will probably increase by 100 percent between now and 1975. 144 Pages. \$2.50. (Write OEEC Sales and Distribution Service, 33 rue de Franqueville, Paris 16^e France for "Oil--Recent Developments in the OEEC Area")
- PHYSIOLOGICAL ASPECTS OF WATER, the proceedings of a Government-sponsored conference designed to stimulate research interest in the physiological aspects of certain chemical constituents of water. 244 Pages. (Available from Research and Training Grants Branch, Division of Water Supply and Pollution Control, U. S. Public Health Service, Washington 25, D. C.)
- GENERAL PURPOSE ADHESIVES, a technical report on attempts by the Sandia Corp. to bond rubber to metal, including recommendations which are expected to improve the quality of bonding, while reducing costs. 10 Pages. (Report SCTM 351-60(25) available through AEC channels or at 50 cents from OTS, U. S. Department of Commerce, Washington 25, D. C.)
- DEPLETED URANIUM HEXAFLUORIDE, a technical report on methods of converting this hazardous waste product to uranium trioxide, which provides a convenient starting material in preparing other uranium compounds for catalyst and for metal-reduction research. (Report by V. E. Shaw and R. A. Falk available for inspection only at U. S. Bureau of Mines Libraries in Washington, D. C., Reno, Nevada and San Francisco, Calif.)
- SALINE WATER CONVERSION REPORT, a relatively non-technical review of developments during 1960 in the U. S. Government-sponsored effort to find ways and means for the economical conversion of saline water. Detailed descriptions of various techniques and demonstration plants. 135 Pages. Free. (Write Director, Office of Saline Water, U. S. Department of Interior, Washington 25, D. C. for 1960 Saline Water Conversion Report)
- COMMUNIST CHINESE PROFESSIONAL MANPOWER AND EDUCATION, a report released by the National Science Foundation as part of its publicity campaign on science in Communist China. 260 Pages. \$2. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication NSF 61-3)

